Refine Search

Search Results -

Terms	Documents
L1 and L2 and interleaver	33

Database:

US Pre-Grant Publication Full-Text Database
US Patents Full-Text Database
US OCR Full-Text Database
EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Search: L10

Refine Search

Recall Text

Clear

Interrupt

Search History

DATE: Thursday, October 13, 2005 Printable Copy Create Case

Set Name side by side	**Query**	**Hit Count**	**Set Name** result set
	DB=USPT; PLUR=YES; OP=OR		
L10	l1 and l2 and interleaver	33	L10
L9	l3 and interleaver	4	L9
L8	l1 same interleaver	6	L8
L7	L5 and interleaver	4	L7
L6	L3 same (transmitter or receiver or transceiver)	13	L6
L5	L3 and (transmitter or receiver or transceiver)	30	L5
L4	L3 and transmitter or receiver or transceiver	263376	L4
L3	L2 same l1	41	L3
L2	(error adj1 correction) or ecc or fec	35833	L2
L1	power adj1 line	34803	L1

END OF SEARCH HISTORY

L10: Entry 32 of 33 File: USPT Dec 21, 1999

DOCUMENT-IDENTIFIER: US 6005477 A
TITLE: Method and apparatus for information transmission via power supply lines

Abstract Text (1):
A method and a system for rapid and interference-free data communication via power supply networks at any voltage levels. The combined effects of interference from signal distortion, frequency-selective signal attenuation or noise and from pulsed interference is reduced by using an MCM multicarrier modulation method. By combining the MCM method with a specially adapted interleaver (data scrambler) and error-protection coding, the error rates can be drastically reduced and the transmission rates can be increased to considerably more than 2 kbit/s.

Brief Summary Text (7):
The invention refers to a prior art as has been disclosed, for example, in European Patent Specification EP 0 238 813 B1. This document discloses a method for data transmission via power supply lines which, in particular, combats the time-selective and frequency-selective fading phenomena in the transmission channel. For this purpose, the information is transmitted a number of times by producing identical information units, symbols or bit words by replication and by transmitting them at a sufficient time interval at different carrier frequencies. In this case, transmissions are always made on only a single carrier frequency, which is varied pseudo-randomly, using a frequency hopping, or FH, method. The carrier frequency modulation is preferably carried out using a phase shift keying, or PSK, method or binary phase shift keying, or BPSK, method, which methods are likewise known. In addition, transmission-dependent symbol corruption can be corrected by means of error-protection coding. The coding is preferably carried out using a so-called forward error correction code, which is known from the literature.

Brief Summary Text (10):
Furthermore, U.S. Pat. No. 4,577,333 discloses a data transmission system for channels with severe electromagnetic interference, such as power supply lines. A composite shift keying (CSK) modulation method is proposed in order to improve the FSK, PSK or a so-called amplitude shift keying (ASK) method. In this case, the bit values 0 and 1 are allocated two frequencies and the transmission of one of the two frequencies is confirmed by an accompanying third frequency. This redundancy, in combination with data block transmission protocols, is used for error identification and correction. Obviously, the limitation to only three fixed carrier frequencies in this case places a considerable limitation on the availability and reliability, as well as the transmission capacity, of the electrical power line as an information channel.

Brief Summary Text (11):
Methods for point-to-point communication on high-tension lines have been published, for example, in "IEEE guide for power-line carrier applications" (Author: Power System Communications Committee of the IEEE) by the Institute of Electrical and Electronic Engineering, New York (1981) under the Report Number ANSI/IEEE Std 643-1980. In the case of point-to-point communication, the transmission system can be matched to the characteristics of the channel, but the flexibility is correspondingly limited.

Brief Summary Text (13):
The interference susceptibility of digital transmission systems can be further improved by interleaving, that is to say scrambling the data to be transmitted, in combination with error correction. Transmission errors in the information reconstructed at the receiving end are then scattered so widely that they can be corrected. A summary of such methods can be found, for example, in B. Sklar, "Digital Communications", pages 357 ff, Prentice Hall, Englewood Cliffs, 1988.

Brief Summary Text (16):
Specifically, the essence of the invention is to combine a multicarrier modulation method with a special interleaver, the interleaver reordering the data in order to separate adjacent data in time and thus to neutralize pulsed interference in conjunction with error protection coding, and the modulator splitting the data between parallel transmission channels with a number of carrier frequencies in order to achieve high data rates and low sensitivity to frequency-selective interference and signal distortion.

Brief Summary Text (17):
A first exemplary embodiment provides a schematic illustration of a unidirectional information link via an electrical power line between two subscribers.

Detailed Description Text (10):
With regard to the detailed method of operation of the MCM method and possible carrier modulation methods (FSK, PSK, ASK, etc.), reference is made here to the documents by J. A. Bingham and B. Sklar cited in the introduction. One important characteristic of the MCM method is the reduction in signal distortion for a constant overall data rate as the number of carrier frequencies, sub-bands and channels increases. Specifically, if there are a number of channels, the symbol length can be increased and the bit rate in each channel can be reduced. Signal distortion can be eliminated completely by introducing time guard intervals between the transmission of individual symbols. The guard interval may also be filled by a so-called cyclic prefix, in which the last part of a symbol is placed in front of the symbol, as a prefix. This method is described, for example, in J. S. Chow et al., "A Discrete Multitone Transceiver System for HDLS Applications", IEEE Journal on Selected Areas in Communications, Vol. 9 No. 6, pages 895-908, August 1991. The robustness against narrowband interference can also be improved by suitable error correction. However, MCM per se is invariably still susceptible to pulsed interference, which temporarily interferes with communication on a number of carriers, or even leads to a brief interruption in transmission on all carriers. This susceptibility can be partially overcome at the expense of the overall transmission rate or by using error protection coding.

Detailed Description Text (11):
The invention solves this problem more effectively, even for high data transmission rates of 2 Kbit/s and above, by providing a new interleaving method which is adapted to the MCM method such that immunity to all three types of interference is achieved in combination with error protection coding. In B. Sklar, "Digital Communications", page 357 ff., a distinction is drawn for conventional interleavers between block interleavers and convolution interleavers. In block interleavers, data are read into a matrix in columns and are read out again in lines. In convolution interleavers, data are regrouped by reading into and out of shift registers of different lengths. In contrast, the interleaver according to the invention represents a generalized block interleaver in which, once the matrix has been filled line-by-line, the lines are interchanged before the columns are then read out. In the exemplary embodiments, the exact interleaver rule is described, together with its interaction with the MCM method and error protection coding.

Detailed Description Text (13):
The internal design of the transmitter (1) from FIG. 1, as is suitable for a

preferred embodiment of the method, is shown in FIG. 2. The data to be transmitted are first of all passed within the transmitter (1) to a coder (6), which preferably operates using a forward error correction code. Details of the code and the coder may be found, for example, in the book cited initially by B. Sklar or in W. Peterson and E. Weldon, "Error Correcting Codes", MIT Press, Cambridge, USA, 1972. The coding of data is based on providing redundancy, for example by convolution coding or insertion of control data. The data that result from the coding process are then scrambled in an interleaver (7). This results in data which were previously close to one another now being well away from one another. The details of the operation are described with reference to the de-interleaver (16). The reordered data pass from the interleaver (7) to the modulator (8) where they are modulated according to the invention, using multicarrier modulation (MCM).

Detailed Description Text (15):
One possible implementation of the receiver (5) is shown in FIG. 4. The received signal is picked off from the network line (3) via the coupling element (4), is separated from other, interference frequencies in a frequency filter (13), and is amplified in a variable gain amplifier (14). The amplifier is followed by an MCM demodulator (15) which demodulates the signal modulated according to the invention back to the baseband again. The structure of the demodulator depends, inter alia, on the number of modulated channels, and may preferably be carried out by a discrete Fourier transformation, a fast Fourier transformation or a Goertzel transformation. The information required for demodulation relating to synchronization of the data block transmission between the transmitter and receiver is produced in a synchronization circuit (18). The demodulated signal is scrambled in a de-interleaver (16). such that the reordering produced in the interleaver (7) is reversed. Finally, on the output side, the receiver (5) also has a decoder (17) which converts the data coded using the forward error correction code back into uncoded data again. For decoding, a Viterbi decoder may be used, in particular, for a convolution code. This allows the error rate to be reduced considerably.

Detailed Description Text (16):
The aim of the scrambling in the interleaver (7) and de-interleaver (16) is to distribute the errors produced by the transmission channel such that the damage to the information transmission is limited and, in particular, a forward error correction code is optimally effective. If a convolution code is used, the minimum distance between two erroneous data items at the input of the decoder (17) should be as great as possible, that is to say the erroneous data items should be distributed uniformly, and should not occur in bursts. Such error bursts on the network line (3) are caused by narrowband interference and pulsed interference. The MCM modulation method used, in which the data to be transmitted are preferably combined, as described further below, to form individual symbols, has the desirable characteristic of distributing narrowband interference uniformly in the demodulated data stream. However, pulsed interference leads to an error burst at the output of the demodulator (15). The combination of an interleaver (7) and de-interleaver (16) is therefore intended to operate such that the errors resulting from the two types of interference are uniformly distributed at the output of the de-interleaver (16).

Detailed Description Text (17):
Conventional block or convolution interleavers do not satisfy the specific requirements and lead to an undesirably high error rate. This serious disadvantage can be overcome by using the method according to the invention. For this purpose, the data to be transmitted are split into blocks of P sub-symbols (P=data block length). A sub-symbol in this case means those data items which are transmitted within one symbol on one MCM channel. The individual sub-symbols at the input of the interleaver (7) and at the output of the de-interleaver (16) are called ordered sub-symbols and are numbered successively from I=0, 1, . . . P-1. The individual sub-symbols at the output of the interleaver (7) and at the input of the de-interleaver (16) are called scrambled sub-symbols, and are numbered successively

from J=0, 1, . . . P-1. I and J thus represent the sequence of the ordered and scrambled sub-symbols.

Detailed Description Text (18):
The reordering rules according to the invention for the interleaver (7) and the de-interleaver (16) are:

Detailed Description Text (20):
The last condition means that K.sub.1 and K.sub.2 cannot be divided by P. This ensures that all the ordered sub-symbols are mapped uniquely onto the scrambled sub-symbols, and that the operation carried out by the de-interleaver (16) is precisely the opposite of that carried out by the interleaver (7). This interleaver is a generalized block interleaver. The individual sub-symbols are read in columns into a matrix having K.sub.1 lines and K.sub.3 columns, K.sub.3 being the smallest integer greater than or equal to P/K.sub.1, the lines are interchanged and the sub-symbols are then read outline-by-line.

Detailed Description Text (21):
For optimum operation of the interleaver in combination with the MCM modulation method, it is furthermore assumed that a block is coded into N symbols of M sub-symbols (M=number of sub-symbols per symbol, P=M.multidot.N), the first symbol containing the scrambled sub-symbols J=0, 1 . . . M-1, the second symbol containing the scrambled sub-symbols M, M+1, . . . 2M-1 etc., and that the number of channels for the MCM method is chosen to be equal to M, the scrambled sub-symbols in a block being mapped in a defined sequence onto the MCM channels. Equation (3) then states that K.sub.1 and K.sub.2 cannot be divided by M or N. All possible implementations of the de-interleaver (16) which satisfy the conditions (1)-(3) have the characteristic that they uniformly distribute the errors produced by a narrowband interference source over the datastream at the output of the de-interleaver (16). If all the sub-symbols in one of the M channels are subject to interference at the input of the de-interleaver (16), then these errors occur at the output of the de-interleaver (16) with the maximum possible interval M. The structure of the interleaver thus guarantees that, with the MCM method, the sub-symbols in a symbol are transmitted on different sub-bands, despite the scrambling. For this reason, the interleaver is compatible with the MCM method.

Detailed Description Text (24):
In summary, it can be said that, on the one hand, the invention makes use of the advantages of the MCM method in terms of interference immunity and transmission rate for a new transmission channel and, on the other hand, a further considerable improvement is achieved by means of a new interleaver and error protection coding. Overall, the invention provides a method for data transmission in power supply networks, in which the influence of network-specific interference on the transmission is considerably reduced, and a high data rate can nevertheless be achieved.

Other Reference Publication (1):
"IEEE Guide for Power-Line Carrier Applications", IEEE publication Std 643-1980, Jan. 30, 1981.

CLAIMS:

4. The method as claimed in claim 1, wherein the sub-symbols are error-protection coded at the transmission end, using a forward error correction code, and the uncoded sub-symbols are recovered at the receiving end by decoding, using a Viterbi decoder.

6. A system for data transmission via a power supply network which comprises a transmitter having an interleaver and a modulator, and a receiver having a demodulator and a de-interleaver, wherein

a) the interleaver converts an ordered sub-symbol sequence I=0, 1, . . . P-1 of a data block of length P into a scrambled sub-symbol sequence J=0, 1, . . . P-1 in accordance with a rule J(I)=(K.sub.1 .multidot.I) mod (P) (I, J, P, K.sub.1 =positive integers)

b) the modulator receives an output of the interleaver and contains a serial/parallel converter and an MCM multicarrier modulator,

c) the de-interleaver converts the scrambled sub-symbol sequence back into the ordered sub-symbol sequence in accordance with a rule I(J)=(K.sub.2 .multidot.J) mod (P), (K.sub.2 =positive integer) and

d) K.sub.1, K.sub.2 are constants which satisfy the relationship (K.sub.1 .multidot.K.sub.2) mod (P)=1.

9. The system for data transmission via a power supply network as claimed in claim 6, wherein

a) the transmitter comprises a coder which operates using a forward error correction code, and

b) the receiver comprises a decoder, which is a Viterbi decoder.

Previous Doc Next Doc Go to Doc#

L6: Entry 12 of 13 File: USPT Mar 10, 1998

DOCUMENT-IDENTIFIER: US 5727025 A
TITLE: Voice, music, video and data transmission over direct current wires

Abstract Text (1):
An apparatus for the transmission of information along a noisy DC power line. The apparatus includes one or more interface modules, each of which provides an interface for receiving a high bit-rate digital information signal corresponding to a human voice, music, or a video. The apparatus further includes a channel coder connected to the interface modules for processing the high bit-rate digital information signals to produce a verifiable digital signal which includes information for performance of an error correction to compensate for background noise. The apparatus also includes a modulator connected to the channel coder for converting the verifiable digital signal to an analog signal. Finally, the apparatus includes a transmitter connected to the modulator for transmitting the analog signal along the DC power line.

Detailed Description Text (1):
The DC communication system comprises units described in FIG. 1. Voice (1), music (2), video (3) and data (4) signals are applied to a channel coder (14) through an interface modules (10-13). Each of the modules has a flexible and adaptable handling to meet different types of communication standards i.e. PCM voice coder, digital input and outputs of Digital Audio Tape (DAT), and also interfaces for non-standard devices. Channel coder (14) provides error protection to the bits gathered from the interface modules (10-13). Each one of the input signals is protected with its own error correction means. Modulator module (15) converts the digital signal into an analog one. The Transmitter module (16) converts the signal to a high frequency form, at frequencies dependent on the channel used and modulation technique used, which signal is conducted to the DC power line (17). In the receive path, the signal is converted from high frequency to a baseband signal in the Receiver (18), then converted into bits through the Demodulator (19). Errors in the bit stream are detected and corrected in the Channel decoder (14). The appropriate data is transferred to each of the Interfaces modules (10-13) and then sent to the appropriate outputs of voice (6), music (7), video (8), data (9) according to its selected interface standard. Control module (20) detect the timing for "receive" and "transmit" paths according to tile channel activity, the applied system commands and addresses (5) of the system. The system can operate also in a multi device environment.

L6: Entry 13 of 13 File: USPT Feb 22, 1994

DOCUMENT-IDENTIFIER: US 5289476 A
**** See image for Certificate of Correction ****
TITLE: Transmission mode detection in a modulated communication system

Brief Summary Text (13):
Data is transmitted through the power line by the transceiver in packets. The transceiver of the present invention includes a preamble generator which creates a preamble for each of the data packets and a preamble decoder that decodes the preamble of a data packet and determines word sync for the packet. The preamble is positioned by the preamble generator in front of the packets of encoded data prior to transmission. The preamble generated by the preamble generator consists of a carrier detect interval, a carrier sync interval, a bit sync interval, and a word sync pattern. The carrier detect interval of the preamble is used by the receiver to identify the beginning of a data packet. The carrier sync interval of the preamble is used by a carrier synchronization circuit to identify the phase of the incoming transmission. The bit sync section of the preamble is used by a bit (baud) synchronization circuit to indicate the positions of baud symbols within the packet. The word sync pattern in the preamble is used by the preamble decoder to identify the beginning of a baud grouping, called a forward error correcting word (i.e. FEC word). The remainder of the data packet is transmitted and received as a collection of FEC words. The transceiver of the present invention may select either BPSK (Binary Phase Shift Keyed) or QPSK (Quadrature Phase Shift Keyed) transmission modes on a data packet by data packet basis by encoding information into the packet preamble. The transceiver always begins transmitting each packet in the BPSK mode. At a fixed position in the preamble of every packet, after carrier synchronization (if used) and after bit synchronization are complete, the transmitter sends a fixed code (i.e. a transmission mode) indicating to the receiver whether the remainder of the packet will be decoded as BPSK or QPSK data. After decoding the transmission mode in the preamble, the receiver switches to BPSK or QPSK mode accordingly.

L6: Entry 7 of 13 File: USPT Sep 25, 2001

DOCUMENT-IDENTIFIER: US 6295625 B1
TITLE: Error correcting using signal anomaly as a hint

Detailed Description Text (4):
The present invention, in one embodiment, is used in connection with the transmission of data over power lines. In particular, the encoding and decoding of data, including the correcting of errors used in the present invention are embodied in a power line transceiver, other aspects of which are described in co-pending applications Ser. No. 09/183,565, entitled "TRANSMISSION AND DETECTION OF DATA IN A DUAL CHANNEL TRANSCEIVER" and Ser. No. 09/183,588 entitled "METHOD AND APPARATUS FOR DEFINING AND GENERATING LOCAL OSCILLATOR SIGNALS FOR DOWN CONVERTER," both of which have filing dates of Oct. 30, 1998 and are assigned to the assignee of the present invention. An error correcting code (ECC) as will be described below is transmitted with the bits forming code words (in one embodiment the code words are interleaved). The particular ECC described below corrects up to two errors in each byte of data. Other ECCs may be used including those which correct a greater number of errors. A hint signal is developed which allows the correction of a third code word bit. The hint signal relies on the examination of the received signal for anomalies in the signal which are used to develop pointers to potentially incorrect bits where the ECC cannot correct all the errors. The hint is used to verify that a bit, the state of which has been changed, was likely to have been erroneously detected. In particular, the signal anomalies are prioritized thus giving some anomalies more weight than others. More particularly one of the anomalies discussed below is a delta phase pointer which includes a quantified distance indicating the extent of the anomaly. Another signal anomaly is the realigning of the IQ pointer.